

in grain yield among several N rates at initially high soil test $\text{NO}_3\text{-N}$ sites. Grain protein percent significantly increased with the application of N on high soil $\text{NO}_3\text{-N}$ test sites but in most cases differences in grain protein percent among the N treatments above the control were not significant. Grain protein percent decreased with application of N at low rates at low soil $\text{NO}_3\text{-N}$ test sites. However, application of N at higher rates resulted in significantly increased protein percent. Measured variables did not differ significantly among sources of N which were compared, either urea or NH_4NO_3 . These results indicate potential for increasing grain yield and protein percent through proper N fertilizer management for rainfed spring wheat in southwestern Montana.

Science and the Verbal Arts. RUDOLPH J. MARCUS, MoonOak, 605 Cavedale Road, Sonoma CA 95476.

The connection of science with the arts is, of course, not limited to the visual and auditory arts. The connections of science with various verbal arts will be explored in this paper. These include poetry about science and scientists, as well as poetry by scientists. Fiction by scientist-authors and the influence which such works have will be compared to the same author's publications in the journal literature. Overlapping with this category is science fiction written by scientists and non-scientists. Some valid scientific purposes served by science fiction will be explored. Joseph Campbell has called science fiction the myth operative today; other myths of previous times, describing the interaction of scientists with nature, will be listed. Methods of using these myths and stories in class, seminar, and individual settings will be described. Such endeavors not only stimulate personal and scientific imagination. They also promote scientific integrity by revealing possible artifacts which might invalidate the results of our studies, seriously limit their application, or suggest alternative avenues of continued exploration.

An Alternative Interpretation of the 3 K Radiation. P. Marmet. Physics Department, University of Ottawa, Canada K1N 6N5. It is usually claimed that the 3K radiation is issued from a very highly shifted Doppler radiation ($Z \approx 1000$) emitted by the hot matter of the primeval radiation. Alternatives to that origin have not been considered seriously. One knows that there is atomic hydrogen in space. That atomic hydrogen naturally combines into a more stable and highly transparent gas which is molecular hydrogen. Since molecular hydrogen has no electric nor magnetic moment, there is no possible dipole transition. This means that there is no direct spectroscopic way to detect that gas in space. Higher order transitions are highly improbable. Then, no photons can be absorbed or emitted by that gas in the accessible wavelength range. There is then possibly an extremely large amount of undetected molecular hydrogen in space that is compatible with the missing mass. Furthermore, since neutral atomic hydrogen is easily detected, it means that the intergalactic ionization radiation is insufficient to ionize molecular hydrogen just as it is insufficient to ionize atomic hydrogen. Finally, one knows from Planck's equation that all gases, independently of their pressure, emit blackbody radiation. It is also observed that the temperature in space is 3 K. Consequently, one can calculate that a non detectable amount of molecular hydrogen (at 3 K) across cosmological distances in the universe generates quite naturally the 3 K radiation without the need of the Big Bang hypothesis. Therefore, the 3 K radiation is not a proof of the Big Bang.

Calibration of the Pre-sidedress Soil Nitrate Test for Corn Silage in Western Oregon E.S. MARX, N.W. CHRISTENSEN, and J.M. HART. Crop and Soil Science Dept., Oregon State University, Corvallis, OR 97331-7306

The Pre-sidedress Soil Nitrate Test (PSNT) measures $\text{NO}_3\text{-N}$ concentration in the top 30 cm of soil when corn (*Zea mays* L.) is at the 5 to 6-leaf stage. This *in situ* assessment of N mineralization is used to predict field corn response to mid-season N fertilization in Northeast and Mid-Atlantic states, but has not been calibrated in the Pacific Northwest. Calibration of the PSNT on western Oregon dairy farms was initiated to encourage efficient use of N from manure and fertilizers. In the first year of a two-year study, corn silage yield and quality responses to supplemental N were measured in 14 experiments on ten farms. Replicated treatments of 200 kg urea-N ha⁻¹ sidedressed at the V5 growth stage were superimposed on existing management of silage corn grown on soils which differed in manure application history. Silage yield, crude protein, and crop N removal were increased significantly by N treatment at a few sites. A

preliminary PSNT critical value of 23 mg $\text{NO}_3\text{-N kg}^{-1}$ was estimated by plotting relative yield vs. soil $\text{NO}_3\text{-N}$ and was consistent with published critical values. At-planting and post-harvest concentrations of soil $\text{NO}_3\text{-N}$ to 150 cm showed that N was often applied in excess of crop requirements when corn silage was irrigated with water from manure lagoons.

The Gender Difference on the Mental Rotations Test as a Function of Rotational Dimensionality. MARY MASTERS (Psychology Department, San Jose State University).

Men perform significantly better than women on the Vandenberg Mental Rotations test and the magnitude of the gender difference is much larger than on any other visual-spatial test. The Vandenberg test requires identification of representations of complex three-dimensional figures after rotation in three-dimensional space. This study was designed to determine which aspect of the Vandenberg test accounts for this greater gender difference: the three-dimensionality of the rotation or merely the complexity of the stimuli. College men and women were administered two versions of the Vandenberg test: a "3-d Rotation test" consisting of 10 items from the original Vandenberg test and a "2-d Rotation test" in which the same 10 three-dimensional stimuli were rotated in two-dimensional space. Analyses showed that men performed significantly better than women on both mental rotation tests, but that the magnitude of the gender difference was much greater on the 3-d Rotation test. Both men and women performed better on the 2-d than on the 3-d Rotation test, but the decrease in performance on the 3-d test was much greater for women than for men.

Response of Cotton to Potassium Fertilization on High Potassium Soils

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Cotton responds to K usually on soils rated low to medium in soil test K. However, rapid-maturing cotton cultivars have a strong demand for plant available K during fruit maturation. This study was conducted to determine the need for supplemental K fertilization of cotton grown on a typical South Texas soil testing adequate to high in available K. Soil and foliarly-applied KNO_3 fertilizer was compared with soil-applied KCl. Combinations of preplant and sidedress applications were studied. Treatments were arranged in a randomized block design with four replications. Results of the three-year study show variable crop response to K treatment. In all years, cotton failed to respond to foliarly-applied KNO_3 or soil-applied KCl. However, soil-applied KNO_3 at 20 lb Ac⁻¹ increased lint yields significantly (116 lb Ac⁻¹) in 1992 (first year treatment) and showed an 81 lb Ac⁻¹ yield increase in 1993. Increase in boll size and boll numbers reflected the lint increase. Of the four fiber properties studied, only fiber strength appeared to be consistently improved by soil-applied KNO_3 . Cotton petiole analyses showed some increase in K concentration due to K treatment but the effects were not consistent.

Historical factors which influence the genetic diversity of the endangered Morro Bay Kangaroo Rat (*Dipodomys heermanni morroensis*) revealed by sequencing mtDNA from museum specimens. MARJORIE MATOCC and C. ORREGO (Conservation Genetics Lab, San Francisco State University).

Populations that have been isolated and reduced to a small number of individuals are expected to experience a loss in genetic diversity at the nucleotide level. We explore this in kangaroo rats by examining the nucleotide diversity within one population through time. In 1918, the Morro Bay kangaroo rat (*Dipodomys heermanni morroensis*) population is believed to have been one contiguous group of approximately 35,000 animals. In 1986, this population consisted of only 50 individuals existing in a small portion of the original range. Sequence from a section of the cytochrome b gene of the mitochondrial genome was obtained from museum specimens collected in 1918 and 1986. At this level, there was no variation observed within or between temporal samples ($N = 8$, $N = 8$). However, within a neighboring allopatric subspecies (*D. h. arenae*) three distinct haplotypes were found at this locus ($N = 3$). These data suggest that *D. h. morroensis* may have experienced at least one historic population bottleneck prior to